Appendix A. LESA Evaluation Worksheets

Bacon Island

Land Evaluation Worksheet

Land Capability Classification (LCC) and Storie Index Scores

A Soil Map Unit	B Project Acres	C Proportion of Project Area	D LCC	E LCC Rating	F LCC Score	G Storie Index	H Storie Index Score
Itano silty clay loam	140	0.024	3W	60	1.44	43	1.032
Kingle muck	1451	0.254	3W	60	15.24	32	8.128
Kingle-Ryde complex	477	0.084	3W	60	5.04	36	3.024
Rindge muck	2624	0.459	3W	60	27.54	40	18.36
Rindge mucky silt loam	94	0.016	3W	60	0.96	47	0.752
Ryde clay loam	390	0.068	3W	60	4.08	40	2.72
Totals	See page 2	(Must Sum to 1.0)		***LCC Total Score***	See page 2	***Storie Index Total Score***	See page 2

Site Assessment Worksheet 1.

Project Size Score

	I LCC Class I - II	J LCC Class III	K LCC Class IV - VIII
		140	
		1451	
		477	
		2624	
		94	
		390	
Total Acres		See page 2	
Project Size Scores			

Highest Project Size Score

Bacon Island

Land Evaluation Worksheet

Land Capability Classification (LCC) and Storie Index Scores

A	B	C	D	E	F	G	H
Soil Map Unit	Project Acres	Proportion of Project Area	LCC	LCC Rating	LCC Score	Storie Index	Storie Index Score
Ryde silty clay loam	267	0.047	3W	60	2.82	43	2.021
Ryde-Peltier complex	69	0.012	3W	60	0.72	38	0.456
Venice muck	60	0.011	3W	60	0.66	40	0.44
Venice mucky silt loam	141	0.025	3W	60	1.5	47	1.175
Totals	5713	(Must Sum to 1.0) 1.0		***LCC Total Score***	60	***Storie Index Total Score***	38.108

Site Assessment Worksheet 1.

Project Size Score

	I	J	K
	LCC Class I - II	LCC Class III	LCC Class IV - VIII
		267	
		69	
		60	
		141	
Total Acres		5713	
Project Size Scores		100	
Highest Project Size Score		100	

Bacon Island

Site Assessment Worksheet 2. - Water Resources Availability

A	B	C	D	E
Project Portion	Water Source	Proportion of Project Area	Water Availability Score	Weighted Availability Score (C x D)
1	Riparian	1.0	100	100
2				
3				
4				
5				
6				
		(Must Sum to 1.0)	***Total Water Resource Score***	100

Note: Bacon Island has both riparian and appropriative water rights. The irrigation system is set up so that Bacon Island can be fully irrigated by either riparian or appropriative water rights (Forkel 2003 personal communication; see "Notes").

Bacon Island

Site Assessment Worksheet 3.
Surrounding Agricultural Land and Surrounding Protected Resource Land

A	B	C	D	E	F	G
Zone of Influence						
Total Acres	Acres in Agriculture	Acres of Protected Resource Land	Percent in Agriculture (A/B)	Percent Protected Resource Land (A/C)	Surrounding Agricultural Land Score (From Table)	Surrounding Protected Resource Land Score (From Table)
21941	10813	9438	49%	43%	20	10

See Figures 1-3 for zone of influence, and the surrounding agricultural and protected resource land within the zone of influence.

Calculations done according to 1997 LESA instruction manual accessed 4/30/03 at http://www.consrv.ca.gov/DLRP/LESA/lesamodl.pdf

Surrounding agricultural land and surrounding protected resource land scores taken from Tables 6 and 7 in manual listed above.

NOTES

Determination: The project's conversion of Bacon Island agriculture to reservoir storage is a significant impact according to Table 9 in the 1997 LESA manual.

Final LESA Score Sheet

Calculation of the Final LESA Score:

(1) Multiply each factor score by the factor weight to determine the weighted score and enter in Weighted Factor Scores column.
(2) Sum the weighted factor scores for the LE factors to determine the total LE score for the project.
(3) Sum the weighted factor scores for the SA factors to determine the total SA score for the project.
(4) Sum the total LE and SA scores to determine the Final LESA Score for the project.

	Factor Scores	Factor Weight	Weighted Factor Scores
LE Factors			
Land Capability Classification	<1> 60	0.25	15
Storie Index	<2> 38	0.25	10
LE Subtotal		***0.50***	25
SA Factors			
Project Size	<3> 100	0.15	15
Water Resource Availability	<4> 100	0.15	15
Surrounding Agricultural Land	<5> 20	0.15	3
Protected Resource Land	<6> 10	0.05	0.5
SA Subtotal		***0.50***	34
		Final LESA Score	59

For further information on the scoring thresholds under the California Agricultural LESA Model, consult Section 4 of the Instruction Manual.

Webb Tract

Land Evaluation Worksheet

Land Capability Classification (LCC) and Storie Index Scores

A	B	C	D	E	F	G	H
Soil Map Unit	Project Acres	Proportion of Project Area	LCC	LCC Rating	LCC Score	Storie Index	Storie Index Score
Kingle muck	37	0.007	3W	60	0.42	32	0.224
Merritt loam	142	0.026	2W	80	2.08	60	1.56
Piper fine sandy loam	263	0.048	4W	40	1.92	23	1.104
Piper loamy sand	11	0.002	3S	60	0.12	32	0.064
Rindge muck	4399	0.809	3W	60	48.54	40	32.36
Ryde silt loam	489	0.090	3W	60	5.4	50	4.5
Totals	See page 2	(Must Sum to 1.0)		***LCC Total Score***	See page 2	***Storie Index Total Score***	See page 2

Site Assessment Worksheet 1.

Project Size Score

	I	J	K
	LCC Class I - II	LCC Class III	LCC Class IV - VIII
		37	
	142		
			263
		11	
		4399	
		489	
Total Acres	See page 2	See page 2	See page 2
Project Size Scores			

Highest Project Size Score

Webb Tract

Land Evaluation Worksheet

Land Capability Classification (LCC) and Storie Index Scores

A	B	C	D	E	F	G	H
Soil Map Unit	Project Acres	Proportion of Project Area	LCC	LCC Rating	LCC Score	Storie Index	Storie Index Score
Shima muck	100	0.018	3W	60	1.08	32	0.576
Totals	5441	(Must Sum to 1.0) 1.0		***LCC Total Score***	60	***Storie Index Total Score***	40

Site Assessment Worksheet 1.

Project Size Score

	I	J	K
	LCC Class I - II	LCC Class III	LCC Class IV - VIII
		100	
Total Acres	142	5036	263
Project Size Scores	100	100	80
Highest Project Size Score		100	

Webb Tract

Site Assessment Worksheet 2. - Water Resources Availability

A	B	C	D	E
Project Portion	Water Source	Proportion of Project Area	Water Availability Score	Weighted Availability Score (C x D)
1	Riparian	1.0	100	100
2				
3				
4				
5				
6				
		(Must Sum to 1.0)	***Total Water Resource Score***	100

Note: Webb Tract has both riparian and appropriative water rights. The irrigation system is set up so that Webb Tract can be fully irrigated by either riparian or appropriative water rights (Forkel 2003 personal communication; see "Notes").

Webb Tract

Site Assessment Worksheet 3.
Surrounding Agricultural Land and Surrounding Protected Resource Land

A	B	C	D	E	F	G
Zone of Influence					Surrounding Agricultural Land Score (From Table)	Surrounding Protected Resource Land Score (From Table)
Total Acres	Acres in Agriculture	Acres of Protected Resource Land	Percent in Agriculture (A/B)	Percent Protected Resource Land (A/C)		
18339	6003	7080	33%	39%	0	0

See Figures 1-3 for zone of influence, and the surrounding agricultural and protected resource land within the zone of influence.

Calculations done according to 1997 LESA instruction manual accessed 4/30/03 at http://www.consrv.ca.gov/DLRP/LESA/lesamodl.pdf

Surrounding agricultural land and surrounding protected resource land scores taken from Tables 6 and 7 in manual listed above.

LESA Worksheet (cont.)

NOTES

Determination: The project's conversion of Webb Tract agriculture to reservoir storage is a significant impact according to Table 9 in the 1997 LESA manual.

Final LESA Score Sheet

Calculation of the Final LESA Score:

(1) Multiply each factor score by the factor weight to determine the weighted score and enter in Weighted Factor Scores column.
(2) Sum the weighted factor scores for the LE factors to determine the total LE score for the project.
(3) Sum the weighted factor scores for the SA factors to determine the total SA score for the project.
(4) Sum the total LE and SA scores to determine the Final LESA Score for the project.

	Factor Scores	Factor Weight	Weighted Factor Scores
LE Factors			
Land Capability Classification	<1> 60	0.25	15
Storie Index	<2> 40	0.25	10
LE Subtotal		***0.50***	25
SA Factors			
Project Size	<3> 100	0.15	15
Water Resource Availability	<4> 100	0.15	15
Surrounding Agricultural Land	<5> 0	0.15	0
Protected Resource Land	<6> 0	0.05	0
SA Subtotal		***0.50***	30
		Final LESA Score	55

For further information on the scoring thresholds under the California Agricultural LESA Model, consult Section 4 of the Instruction Manual.

Appendix B. Plant Species Found During 2002 Botanical Surveys on In-Delta Storage Project Islands

Scientific name	Common name	Native	status/list
FERNS AND FERN ALLIES			
AZOLLACEAE			
Azolla filiculoides	water fern	y	
DENNSTAEDIACEAE			
Pteridium aquilinum var. pubescens	bracken fern	y	
EQUISETACEAE			
Equisetum arvense	common horsetail	y	
Equisetum laevigatum	smooth scouring rush	y	
DICOTS			
ACERACEAE			
Acer negundo	box elder	y	
AMARANTHACEAE			
Amaranthus retroflexus	redroot pigweed	n	
ANACARDIACEAE			
Toxicodendron diversilobum	poison oak	y	
APIACEAE			
Anthriscus caucalis	bur-chervil	n	
Ciclospermum leptophyllum	ciclospermum	n	
Conium maculatum	poison hemlock	n	
Foeniculum vulgare	fennel	n	
Hydrocotyle verticillata	hydrocotyle	y	
Lilaeopsis masonii	Mason's lilaeopsis	y	FSC/CR/1B
APOCYNACEAE			
Apocynum cannabinum	Indian hemp	y	
ASTERACEAE			
Acroptilon repens	Russian knapweed	n	
Anthemis cotula	mayweed	n	
Artemisia douglasiana	mugwort	y	
Aster lentus	Suisun marsh aster	y	FSC/--/1B
Baccharis pilularis	coyote-bush	y	
Bidens frondosa	sticktight	y	
Bidens laevis	bur-marigold	y	
Carduus pycnocephalus	Italian thistle	n	
Centaurea solstitialis	yellow star-thistle	n	
Cichorium intybus	chicory	n	
Cirsium vulgare	bull thistle	n	
Conyza canadensis	horseweed	y	
Cotula australis	small brass buttons	n	
Cotula coronopifolia	brass buttons	n	
Euthamia occidentalis	western goldenrod	y	

Gnaphalium luteo-album	cudweed	n
Helianthus annuus	common sunflower	y
Helenium puberulum	sneezeweed	y
Hemizonia pungens ssp. pungens	common spikeweed	y
Heterotheca grandiflora	telegraph weed	y
Hypochaeris glabra	smooth cat's ear	n
Hypochaeris radicata	rough cat's ear	n
Lactuca serriola	prickly lettuce	n
Picris echioides	bristly ox-tongue	n
Pluchea odorata	salt marsh fleabane	y
Silybum marianum	milk thistle	n
Sonchus asper	spiny sowthistle	n
Sonchus oleraceus	sow thistle	n
Tragopogon dubius	western salsify	n
Xanthium spinosum	spiny cocklebur	y
Xanthium strumarium	cocklebur	y
BETULACEAE		
Alnus rhombifolia	alder	y
BORAGINACEAE		
Myosotis laxa	forget-me-not	y
Amsinckia menziesii var. intermedia	common fiddleneck	y
Amsinckia menziesii var. menziesii	rancher's fireweed	y
Heliotropium curassavicum	heliotrope	y
BRASSICACEAE		
Brassica nigra	black mustard	n
Lepidium latifolium	peppergrass	n
Raphanus raphanistrum	jointed charlock	n
Raphanus sativus	wild radish	n
Rorippa palustris var. occidentalis	yellow cress	y
CARYOPHYLLACEAE		
Spergularia bocconei	sandspurry	n
CAPRIFOLIACEAE		
Lonicera involucrata var. ledebourii	twinberry	y
Sambucus mexicana	blue elderberry	y
CERATOPHYLLACEAE		
Ceratophyllum demersum	hornwort	y
CHENOPODIACEAE		
Chenopodium album	pigweed	n
Salsola tragus	Russian thistle	n
CONVOLVULACEAE		
Calystegia sepium ssp. limnophila	hedge bindweed	y
Convolvulus arvensis	bindweed	n
CRASSULACEAE		

Crassula aquatica	water pygmy weed	y	
CUSCUTACEAE			
Cuscuta sp.	dodder	y	
EUPHORBIACEAE			
Eremocarpus setigerus	doveweed	y	
FABACEAE			
Acacia decurrens	green wattle	n	
Glycyrrhiza lepidota	wild licorice	y	
Hoita macrostachya	hoita	y	
Lathyrus jepsonii var. californica	California pea	n	
Lathyrus jepsonii var. jepsonii	delta tule pea	y	FSC/--/1B
Lotus corniculatus	birdfoot trefoil	n	
Lotus purshianus var. purshianus	Spanish clover	y	
Medicago polymorpha	bur clover	n	
Medicago sativa	alfalfa	n	
Melilotus alba	white sweet clover	n	
Melilotus indica	sourclover	n	
Trifolium hirtum	rose clover	n	
FAGACEAE			
Quercus lobata	valley oak	y	
GERANIACEAE			
Erodium cicutarium	filaree	n	
HALORAGACEAE			
Myriophyllum aquaticum	parrot's feather	n	
Myriophyllum spicatum	Eurasian water-milfoil	n	
JUGLANDACEAE			
Carya illinoiensis	pecan	n	
Juglans californica var. hindsii	black walnut	y	
LAMIACEAE			
Marrubium vulgare	horehound	n	
Mentha arvensis	wild mint	y	
Stachys albens	white hedge nettle	y	
LYTHRACEAE			
Lythrum californicum	California loosestrife	y	
Lythrum hyssopifolium	lythrum	n	
MALVACEAE			
Abutilon threophrasti	velvet-leaf	n	
Hibiscus lasiocarpus	rose-mallow	y	--/--/1B
Malva nicaensis	bull mallow	n	
Malva parviflora	cheeseweed	n	
Malvella leprosa	alkali mallow	n	

MORACEAE			
Ficus carica	edible fig	n	
MYRTACEAE			
Eucalyptus globulus	blue gum	n	
ONAGRACEAE			
Epilobium brachycarpum	fireweed	y	
Ludwigia peploides ssp. peploides	water primrose	y	
PAPAVERACEAE			
Eschscholzia californica	California poppy	y	
PLANTAGINACEAE			
Plantago major	common plantain	n	
POLYGONACEAE			
Polygonum amphibium var. emersum	water smartweed	n	
Polygonum arenastrum	knotweed	n	
Polygonum hydropiperoides	waterpepper	y	
Polygonum persicaria	lady's thumb	n	
Rumex acetocella	sheep sorrel	n	
Rumex crispus	curly dock	n	
Rumex maritimus	golden dock	y	
PRIMULACEAE			
Samolus parviflorus	water pimpernel	y	
RANUNCULACEAE			
Ranunculus sp.	buttercup	?	
ROSACEAE			
Rosa californica	wild rose	y	
Rubus discolor	Himalayan blackberry	n	
Rubus ursinus	California blackberry	y	
RUBIACEAE			
Cephalanthus occidentalis	buttonbush	y	
Galium trifidum var. pacificum	bedstraw	y	
SALICACEAE			
Populus fremontii ssp. fremontii	fremont cottonwood	y	
Salix exigua	narrow-leaved willow	y	
Salix gooddingii	Goodding's willow	y	
Salix laevigata	red willow	y	
Salix lasiolepis	arroyo willow	y	
Salix lucida	shining willow	y	
SCROPHULARIACEAE			
Castilleja exserta	purple owl's clover	y	
Limosella subulata	delta mudwort	y	--/--/2

Mimulus guttatus	monkeyflower	y	
SIMAROUBACEAE			
Ailanthus altissima	tree-of-heaven	n	
SOLANACEAE			
Datura stramonium	jimson weed	n	
Datura wrightii	datura	y	
Nicotiana glauca	tree tobacco	n	
Solanum elaeagnifolium	silverleaf nightshade	n	
TAMARICACEAE			
Tamarix sp.	tamarisk	n	
URTICACEAE			
Urtica dioica ssp. holosericea	hoary nettle	y	
VERBENACEAE			
Verbena hastata	blue vervain	y	
ZYGOPHYLLACEAE			
Tribulus terrestris	caltrop	n	
MONOCOTS			
ALISMATACEAE			
Sagittaria latifolia	arrowhead	y	
CYPERACEAE			
Carex barbarae	Barbara sedge	y	
Carex vulpinoidea	fox sedge	y	--/--/2
Cyperus eragrostis	umbrella sedge	y	
Eleocharis acicularis	small spikerush	y	
Scirpus acutus var. occidentalis	tule	y	
Scirpus americanus	American bulrush	y	
Scirpus californicus	California bulrush	y	
Scirpus maritimus	three-square	y	
Scirpus microcarpus	small-fruited bulrush	y	
HYDROCHARITACEAE			
Egeria densa	Brazilian waterweed	n	
Elodea canadensis	Canadian waterweed	y	
Hydrilla verticillata	hydrilla	n	
IRIDACEAE			
Iris pseudacorus	yellow water iris	n	
JUNCACEAE			
Juncus acuminatus	sharp-fruited rush	y	
Juncus balticus	baltic rush	y	
Juncus bufonius	toad rush	y	
Juncus effusus var. pacificus	Pacific rush	y	

Juncus mexicanus	Mexican rush	y
Juncus xiphioides	iris-leaved rush	y
LEMNACEAE		
Lemna sp.	duckweed	y
LILIACEAE		
Asparagus officinalis	asparagus	n
POACEAE		
Arundo donax	giant reed	n
Avena fatua	wild oats	n
Avena sativa	slender wild oats	n
Bromus catharticus	rescue grass	n
Bromus diandrus	ripgut brome	n
Bromus madritensis ssp. rubens	red brome	
Cortaderia selloana	pampas grass	n
Crypsis shoenoides	swamp grass	n
Cynodon dactylon	Bermuda grass	n
Digitaria sanguinalis	crabgrass	n
Distichlis spicata	salt grass	y
Echinochloa crus-galli	barnyard grass	n
Echinochloa crus-pavonis	large barnyard grass	n
Holcus lanatus	velvet grass	n
Hordeum marinum ssp. gussoneanum	Mediterranean barley	n
Hordeum murinum ssp. leporinum	hare barley	n
Leymus triticoides	alkali rye	y
Lolium multiflorum	annual ryegrass	n
Lolium perenne	perennial ryegrass	n
Paspalum dilatatum	dallis grass	n
Paspalum urvillei	vasey grass	n
Phalaris sp.	canary grass	n
Phragmites australis	common reed	y
Polypogon monspeliensis	rabbitsfoot grass	n
Sorghum halapense	johnsongrass	n
Taeniatherum caput-medusae	medusa-head	n
Vulpia myuros var. myuros	rattail fescue	n
PONTEDERIACEAE		
Eichhornia crassipes	water hyacinth	n
POTAMOGETONACEAE		
Potamogeton crispus	crispate-leafed pondweed	n
Potamogeton pectinatus	fennel-leaf pondweed	y
Potamogeton pusillus	small pondweed	y
TYPHACEAE		
Sparganium sp.	bur-reed	y
Typha latifolia	broad-leaved cattail	y
Typha sp.	narrow-leaved cattail	y

Appendix C. Bat Habitat Assessment and Preliminary Surveys for the In-Delta Storage Program: Webb Tract, Bacon Island, Holland Tract, and Bouldin Island

TECHNICAL MEMORANDUM

Bat Habitat Assessment and Preliminary Surveys for the In-Delta Storage Program: Webb Tract, Bacon Island, Holland Tract, and Bouldin Island

PREPARED FOR: Leslie Pierce / DWR

PREPARED BY: Heather L. Johnson / CH2M HILL

COPIES: Dick Daniel / CH2M HILL
Marjorie Eisert / CH2M HILL

DATE: November 27, 2002

Abstract

Habitat on Webb Tract, Bacon Island, Holland Tract, and Bouldin Island was assessed for bat roosting and foraging suitability as part of impact assessment for the In-Delta Storage Program. Suitable roosting habitat is present on each island in crevices, cavities and foliage found in vegetation and structures. Accessible structures were visually inspected and no roost sites were found. Foraging habitat is present on each island and acoustic surveys at selected sites detected bat activity near water features, riparian vegetation, and open pasture on Bacon Island and Holland Tract. No bats were detected on a single night's survey on Bouldin Island during unfavorable weather. Webb Tract was not surveyed for bat foraging because of access restrictions. Important habitat components were identified including riparian woodlands, lakes and ponds, irrigation canals lined with vegetation, and open pasture with complex vegetation interfaces. Habitat will be lost on Webb Tract and Bacon Island and recommendations were made to create or expand important habitat components on Holland and Bouldin islands. Additional focal species surveys were recommended for Webb Tract and Holland Tract because potential habitat is present but preliminary surveys were insufficient to address the presence of specific species. If presence is assumed mitigation in kind (1:1) should be sufficient. The author does not have a specific reference for the 1:1 mitigation, however, the Army Corps of Engineers requires a 1:1 mitigation ratio for permanent ponds; 2:1 mitigation ratio for the lost of emergent marsh, seasonal wetlands, willow scrub; and a 3:1 mitigation ratio for riparian woodland.

Introduction

Implementation of the In-Delta Storage Program would result in the creation of two reservoir islands, Webb Tract and Bacon Island, and two habitat islands, Holland Tract and Bouldin Island. The reservoir islands would be flooded and existing structures would be removed. The habitat islands would be improved and managed for wildlife under the existing Habitat Management Plan. The Department of Water Resources (DWR) requested that each island be assessed to identify important habitat components for bats and to discuss habitat suitability for special-status bat species. These species are

Townsend's big-eared bat (*Corynorhinus townsendii*), pallid bat (*Antrozous pallidus*), red bat (*Lasiurus blossevillii*), small-footed myotis (*Myotis ciliolabrum*), and Yuma myotis (*M. yumanensis*). This memorandum documents the findings of habitat assessments and preliminary surveys for bats and makes recommendations for future actions regarding these species.

Objectives

The objectives of the habitat assessment as stated in Task Order No. IDS-0502-1841-007 are as follows:

1. Discuss suitability of each island habitat for specific bat species and identify important habitat components. The species identified by the DWR are Townsend's big-eared bat, pallid bat, red bat, small-footed myotis, and Yuma myotis.
2. Discuss potential impacts from flooding the island or removing structures and recommend ways to minimize impacts.
3. Discuss potential impacts from creating the habitat islands.
4. Determine whether specific bat surveys (capture and acoustic sampling) should be completed for each island.

Methods

Habitat assessment on each island was conducted by driving island roads and walking through areas of potential bat habitat. Specific habitat components were investigated for the presence of bats by conducting roost searches and monitoring for foraging activity (Figure 5-19). Land managers, residents, and workers were interviewed regarding bat observations. Two rounds of surveys were conducted in early and late summer on each island to accommodate variation in daily and seasonal bat activity patterns, thus increasing the likelihood of detecting bats, if they are present. DWR assumes some bat species may be present during the winter on the project islands, therefore, winter surveys were not conducted.

Roosting habitat was assessed by identification of crevices and cavities offering protection to bats from weather and predators. On each of the islands, suitable roosting sites were provided primarily by structures (e.g., barns, warehouses, sheds, abandoned homes, pump housings, and bridges) and secondarily by foliage. For structures, assessment consisted of inspections for signs of occupancy, which include roosting bats, urine stains, guano deposits, discarded prey remains, and bat carcasses. Guano deposits of the Townsend's big-eared bat and pallid bat often are immediately recognizable. Foliage was visually assessed but not inspected.

Habitat was considered suitable for foraging if insect prey was available. Assessment of water features and riparian vegetation was emphasized during surveys because they provide foraging opportunities for bats, especially red bats and Yuma myotis. Selected

bat surveys
0
1
2
3
4
Miles

foraging habitat components were acoustically and visually monitored for approximately an hour after sunset. Where access was permitted, surveys were conducted using handheld electronic detectors (Anabat II, New South Wales, Australia) to identify ultrasonic echolocation calls emitted by foraging bats. Surveyors monitored potential habitat components by circling the perimeter, standing within the component, or walking meandering transects through the area. If bat activity was significant, passing bats were spotlighted to note appearance and behavior, and their echolocation calls were monitored using the detector coupled with a laptop computer to view frequency-time sonagrams that aided species identification (Anabat software, Chris Corben, Rohnert Park, California).

A query of the California Natural Diversity Database yielded no occurrence records for bats on any of the islands. Incidental wildlife species observed during habitat assessment surveys are included in Appendix A.

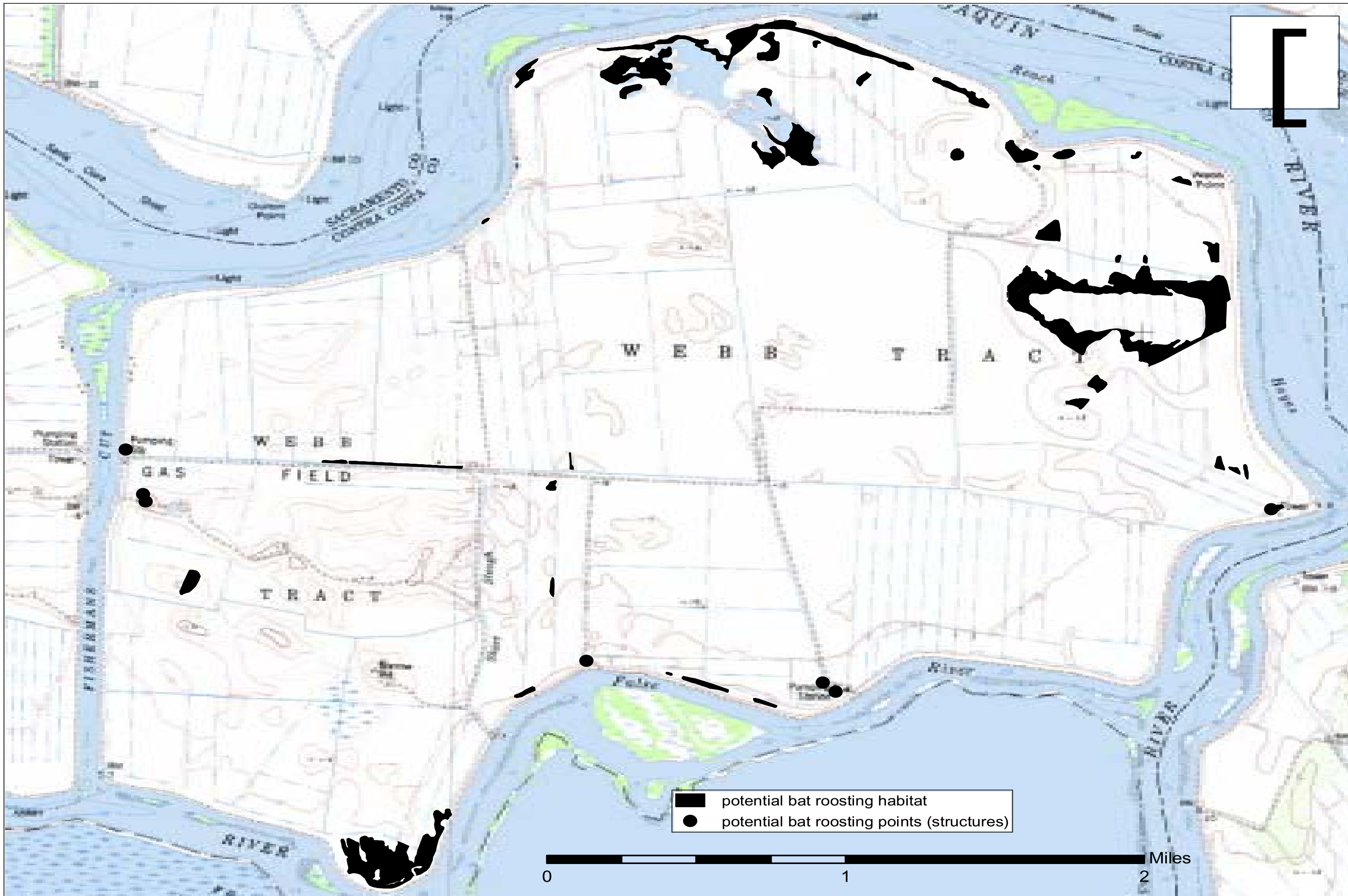
Results

Webb Tract

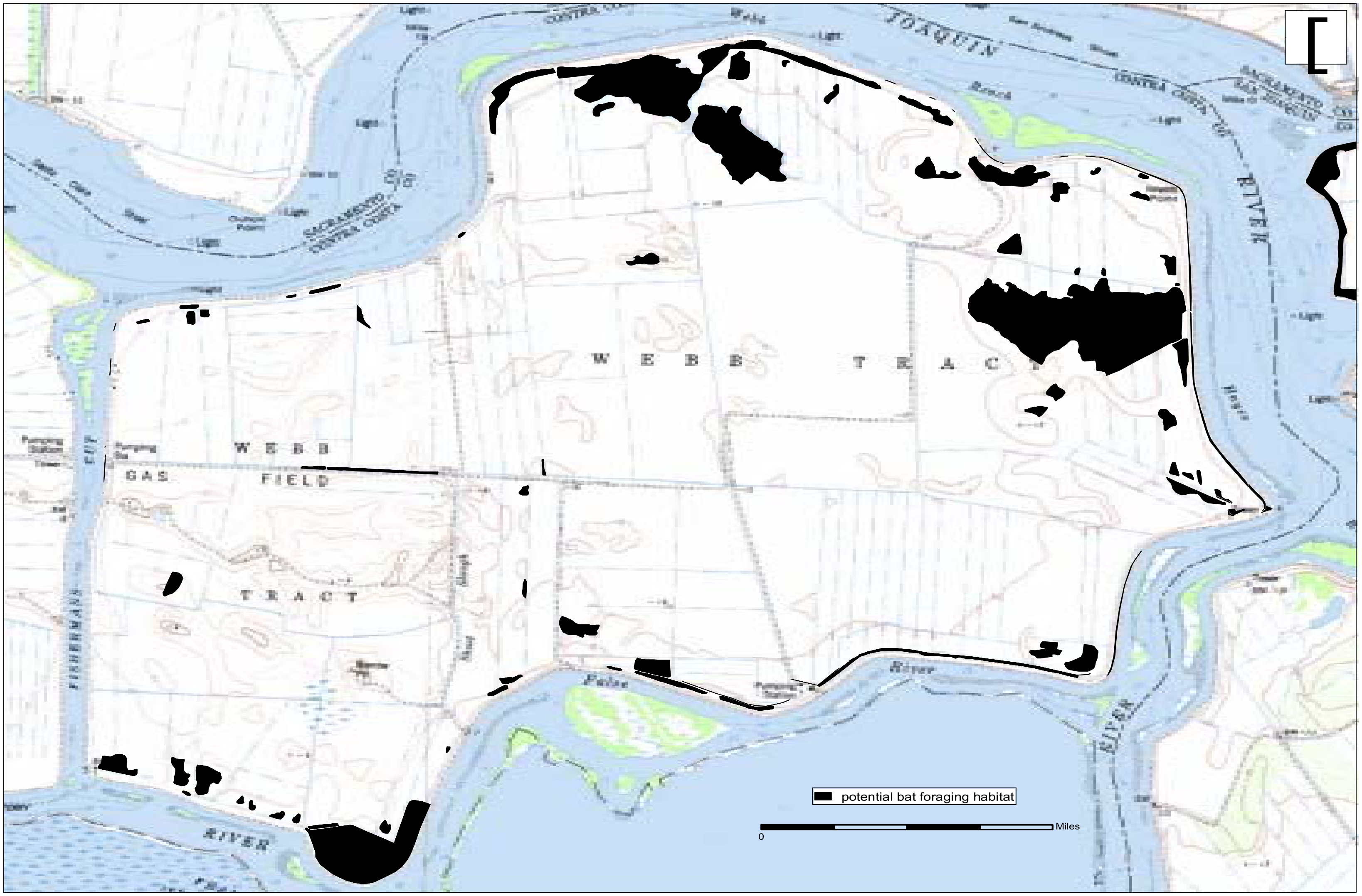
Webb Tract was surveyed on June 10th and August 6th, 2002. Potential roosting and foraging habitat is available on the island, but bat presence was not confirmed. No roosting sites were found during structural inspections. Island access limitations precluded the foraging activity surveys after sunset.

On Webb Tract, the principal roosting and foraging habitat components are riparian and mixed woodland habitat surrounding the two lake features (Figures 5-20 and 5-21). The woodlands are composed primarily of mature willow trees (*Salix* sp.) with a few scattered cottonwood trees (*Populus* sp.) and a shrub understory. Suitable roosting habitat is available in crevices and cavities in the thick bark and open structure of the trees. A few snags with exfoliating bark that bats may roost under were present. No tree hollows were observed during a cursory inspection near the access road.

The overall structure of the woodland habitat is complex, yet open and suitable for foraging. Bats tend to forage by following treelines and circling open areas such as those found in this woodland (Figure 5-22). An abundance of insects and foraging swallows were observed. Swallows are aerial insectivores that roost and forage in habitat similar to that of bats; their presence is indicative of the habitat quality. The lake features appear suitable for drinking and foraging.



WEBB TRACT
WEBB
GAS FIELD
TRACT
FISHERMANS CUT
False River
RIVER
Hayes
potential bat roosting habitat
potential bat roosting points (structures)
0
1
2
Miles



potential bat foraging habitat
0
Miles
JOAQUIN
RIVER
W E B B T R A C T
W E B B
GAS
FIELD
T R A C T
FISHERMANS
CUT
False
River

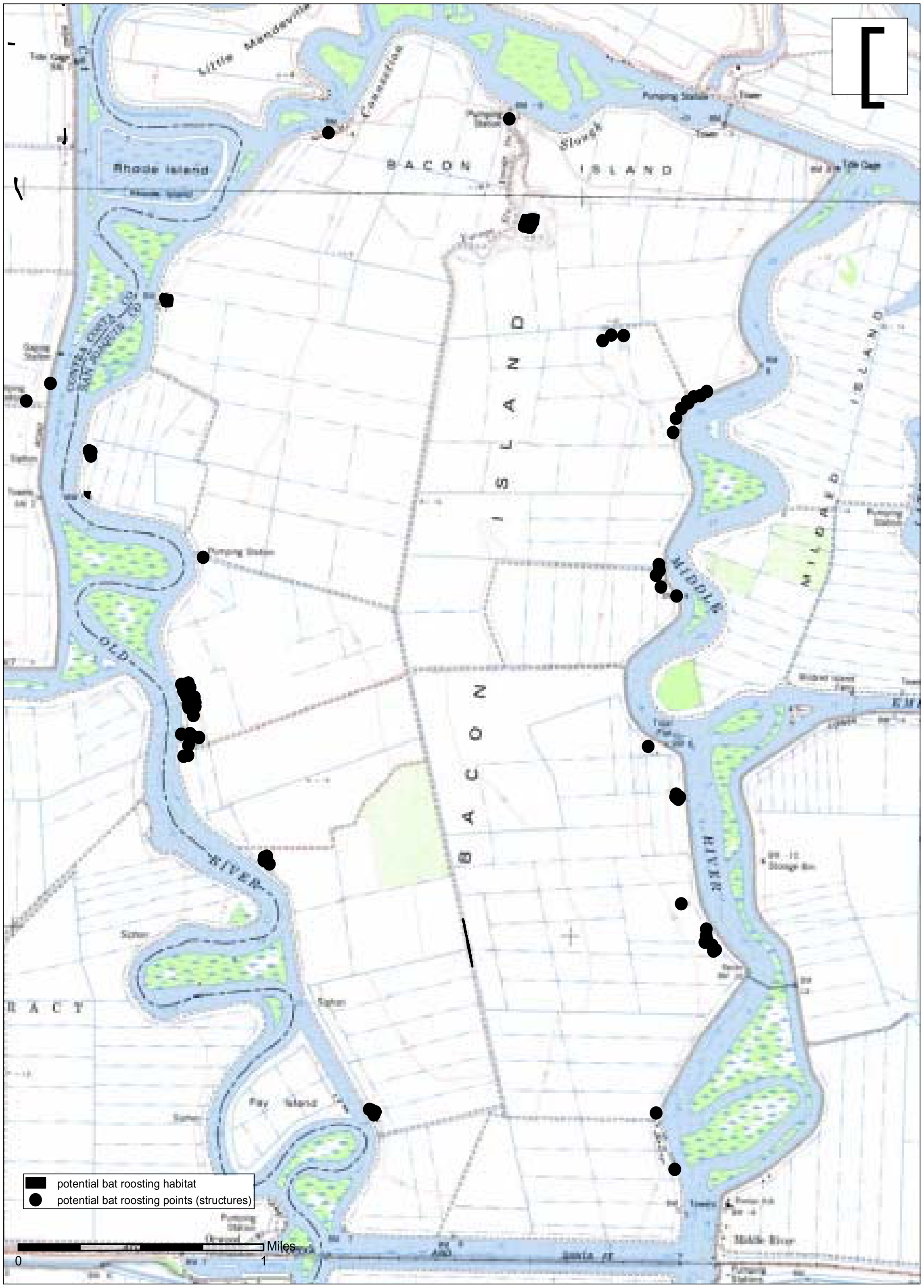
Figure 5-22. Potential roosting and foraging woodland habitat adjacent to a water feature on Webb Tract

Potential roosting habitat was also identified in various structures, which included barns, sheds, warehouses, machinery housings, louvered pump housings, irrigation pipe wooden pole supports, footbridges, a quonset hut warehouse, and an abandoned house. No signs of bat occupancy were found. Swallow nests were ubiquitous in these structures.

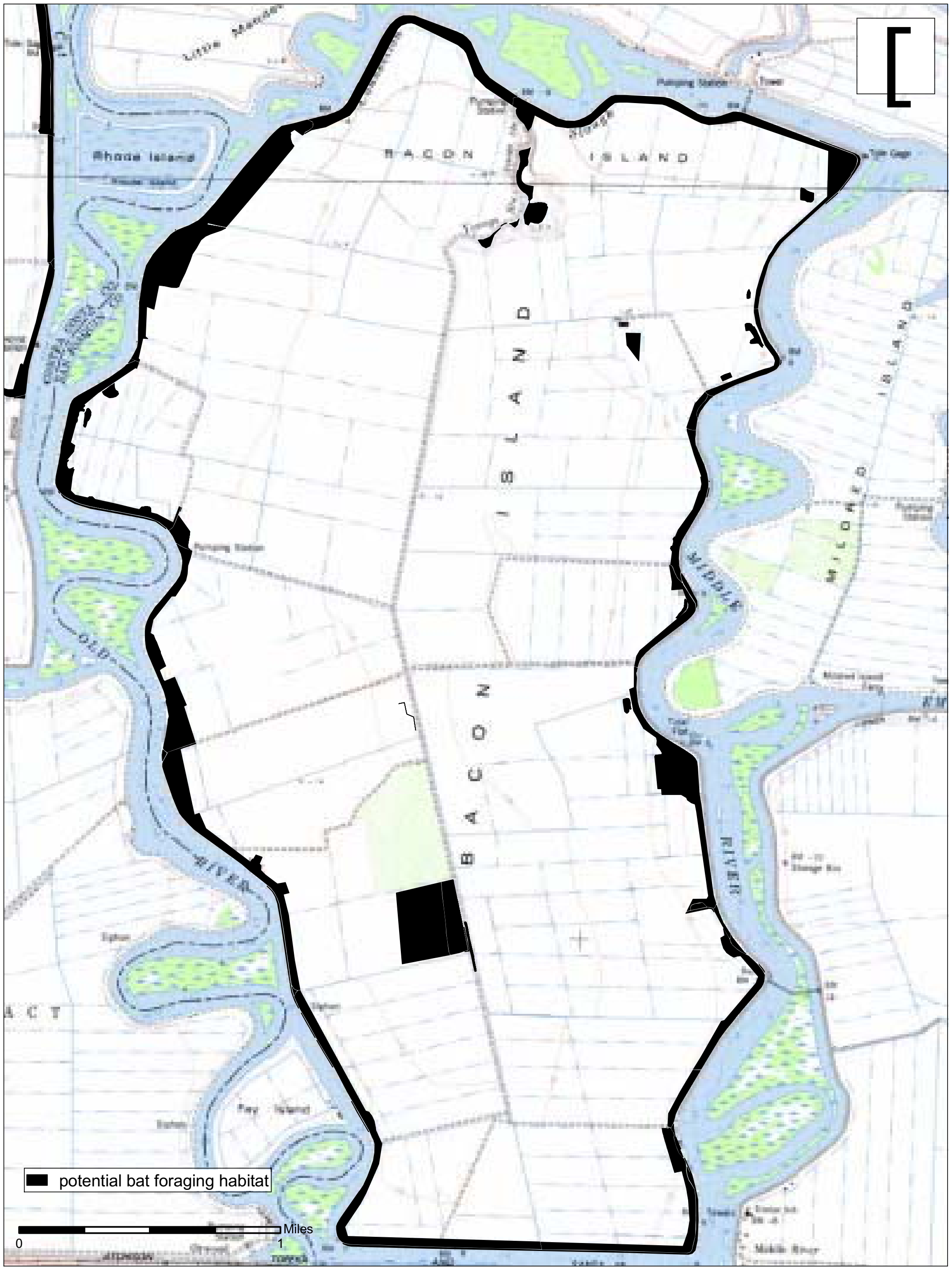
Bacon Island

Bacon Island was surveyed on June 13th and 20th, and August 7th and 8th, 2002. Night surveys were conducted on August 7th and 8th during warm, calm weather. Bats are using various habitat components for foraging and activity was detected in several areas. The bats were not detected until about 40 minutes after sunset, which indicates that they are roosting off the island. Potential roosting habitat is available on the island in vegetation and in numerous structures, which included abandoned homes and sheds, barns, warehouses, and pump housings (Figure 5-23). However no roosting sites were found during structural inspections. Swallow nests and barn owl roosts were found in the structures.

The principal habitat components on Bacon Island are foraging areas that include patches of riparian habitat, irrigation canals, and areas where insects are attracted to lights (Figure 5-24). Low activity by foraging bats was detected at a patch of riparian habitat (Figure 5-25) and along the adjacent irrigation canal where a tree and other



Rhode Island
BACON ISLAND
Slough
MIDDLE
RIVER
OLD
RIVER
MILDRED ISLAND
BACON ISLAND
Pumping Station
Fay Island
Middle River
potential bat roosting habitat
potential bat roosting points (structures)
0
1
Miles



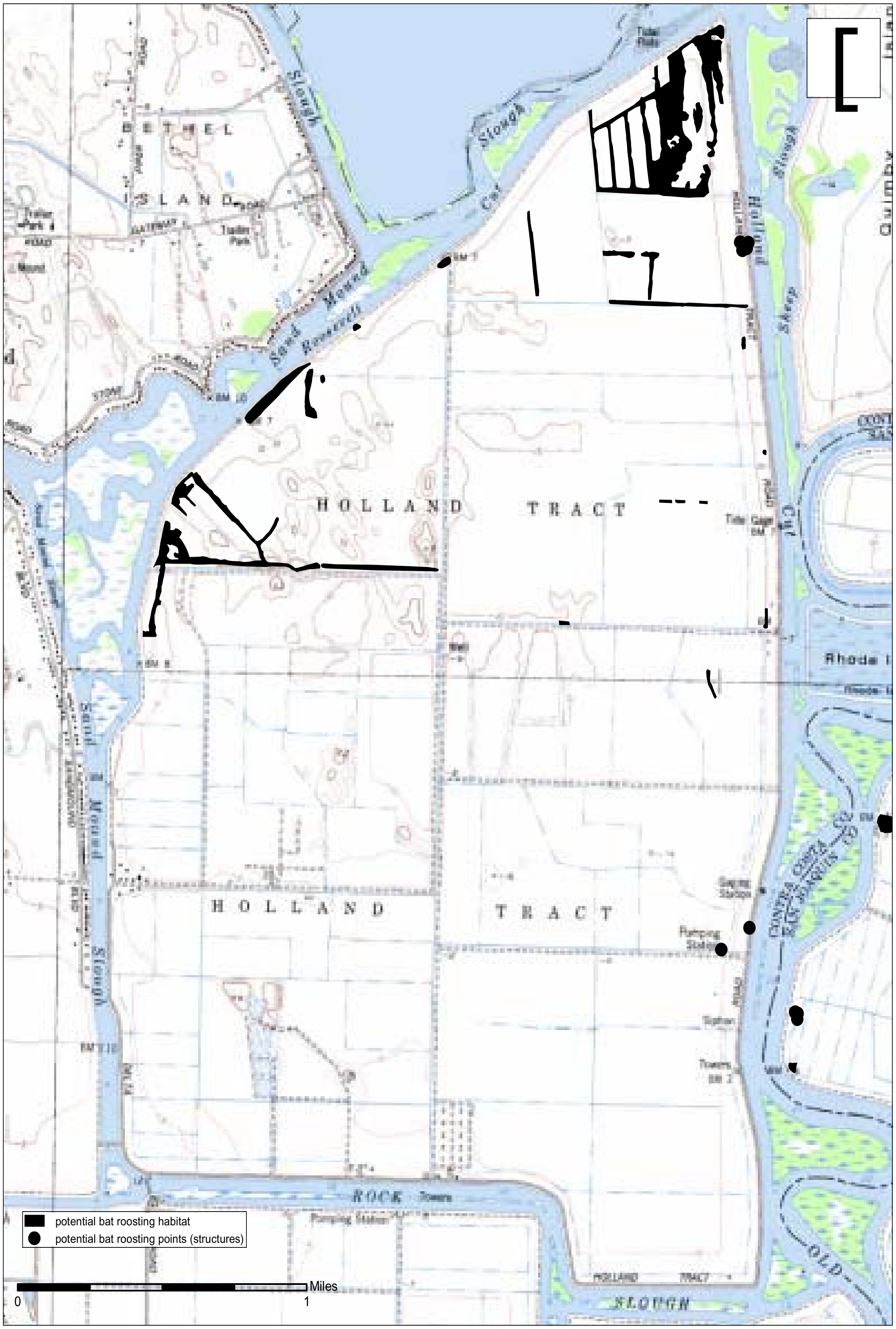
potential bat foraging habitat
0
1
Miles
Rhode Island
BACON ISLAND
BACON ISLAND
OLD RIVER
MIDDLE RIVER
MILDRED ISLAND
Pumping Station
Woodward Island

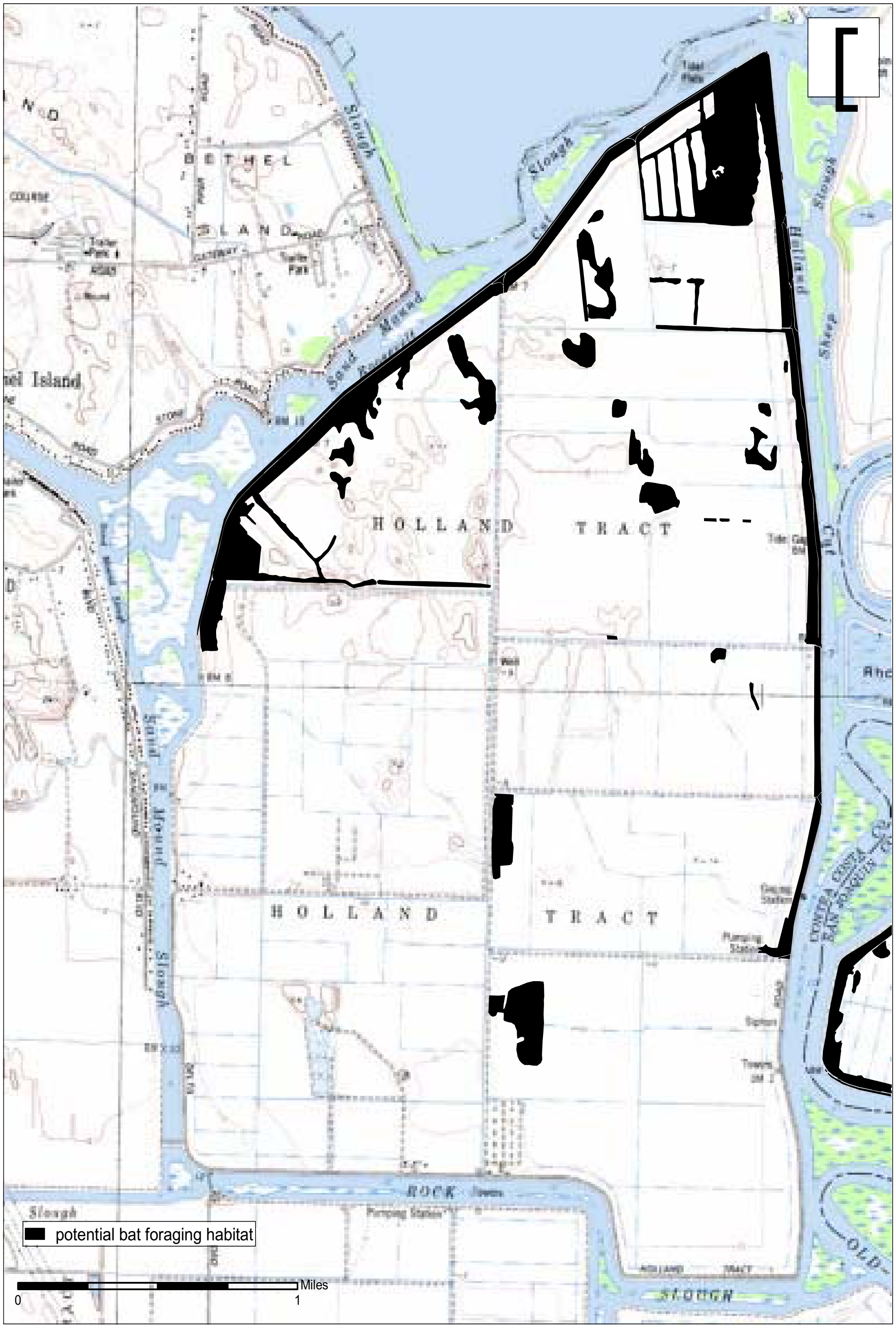
vegetation lined the banks. These two features were remarkably small and isolated and their importance was demonstrated by the presence of the bats. Bats were detected foraging along the canal in another area where vegetation lined the banks near a pump house. High activity by foraging bats was monitored near a mercury vapor light on an outbuilding in the Kyser Farms compound. Copious numbers of insects including crickets, grasshoppers, water beetles, preying mantis, and leaf hoppers were attracted to the light. Mexican free-tailed bats (*Tadarida brasiliensis*) were recorded and spotlighted as they took advantage of the insect swarms. It was not possible to estimate the number of bats observed because individuals cannot be visually tracked as they enter and exit the space illuminated by the spotlight. A resident reported that bats are also attracted to lights near his home.

Figure 5-25. Isolated patch of riparian habitat used by foraging bats on Bacon Island

Holland Tract

Holland Tract was surveyed on June 17th and August 9th, 2002. Night surveys were conducted on both nights in suitable weather conditions. Potential roosting habitat is available, however no roosting sites were found during structural inspections (Figure 5-26). The use of foraging habitat was confirmed in several locations (Figure 5-27). Habitat components on Holland Tract that are utilized by bats include structurally complex interfaces where vegetation is diverse (i.e., with trees, shrubs, and grasslands) and riparian and mixed woodland habitat associated with large lakes. Two particular


BETHEL
ISLAND
HOLLAND TRACT
HOLLAND TRACT
Sand Mound Slough
ROCK SLOUGH
Rhode I
potential bat roosting habitat
potential bat roosting points (structures)
0
1
Miles



BETHEL
ISLAND
HOLLAND TRACT
HOLLAND TRACT
Sand Mound Slough
Holland Cut
Sheep Slough
ROCK SLOUGH
Pumping Station
potential bat foraging habitat
0
1
Miles

areas along the northwestern border featured complex structures for foraging, with open fields, shrubs, and tree lines. Foraging bats were detected in this habitat on June 17th .

The large water features are suitable for drinking and foraging for bats (Figure 5-28). Mexican free-tailed bats and western pipistrelles (*Pipistrellus hesperus*) were detected over the lake on August 9th (based on analysis of echolocation calls). The surrounding woodland vegetation included mature willow trees and scattered cottonwoods which may be suitable for roosting habitat. Trees were not closely inspected however their mature structure and thick bark appeared to offer suitable crevices and cavities. A few snags were present with exfoliating bark that bats may roost under. Unidentified bats were observed executing repeated foraging passes along treelines in the woodland about 20 minutes after sunset on August 9th.

Figure 5-28. Riparian and mixed woodland vegetation associated with a lake where foraging bats were detected on Holland Tract

Potential roosting habitat was also available in various structures, which included a factory building, abandoned homes and sheds, warehouses, machinery housings, and louvered pump housings. No signs of bat occupancy were found. Swallows were observed foraging on insects over the lake, woodland, and crops, and nesting in the abandoned structures.

Bouldin Island

Bouldin Island was surveyed on June 21st and August 5th, 2002. Potential roosting and foraging habitat is available on the island but may not be utilized. No roost sites were found and no bats were detected during the single night survey on August 5th. A worker reported seeing bats flying near a small group of mature cottonwoods in the extreme southwestern corner of the island.

Potential roosting habitat components on Bouldin Island were limited and included a few abandoned buildings and a few small stands of large, mature cottonwoods (Figure 5-29). Trees were not inspected for bats, however hollows, broken limbs, and thick bark may offer suitable crevices and cavities. A bridge along State Route (SR) 12 at the west end of the island appeared to be suitable for bat occupancy but had no sign. Expansion joints along the causeway sections of SR 12 had open crevices but no bats were observed. Pump housings were the only additional roosting habitat available. According to a farm worker, a barn with bats in it had been present in the past but had since burned down.

Potential foraging habitat components included wetland, cropland and fallow fields (Figure 5-30). Mature willow trees and willow shrubs were also present. No bats were detected during an acoustic survey at the wetlands near the middle of the island. The weather on the survey night was warm but windy and may have affected bat foraging behavior. Swallows were observed foraging over the island and indicate suitable habitat for aerial insectivores.

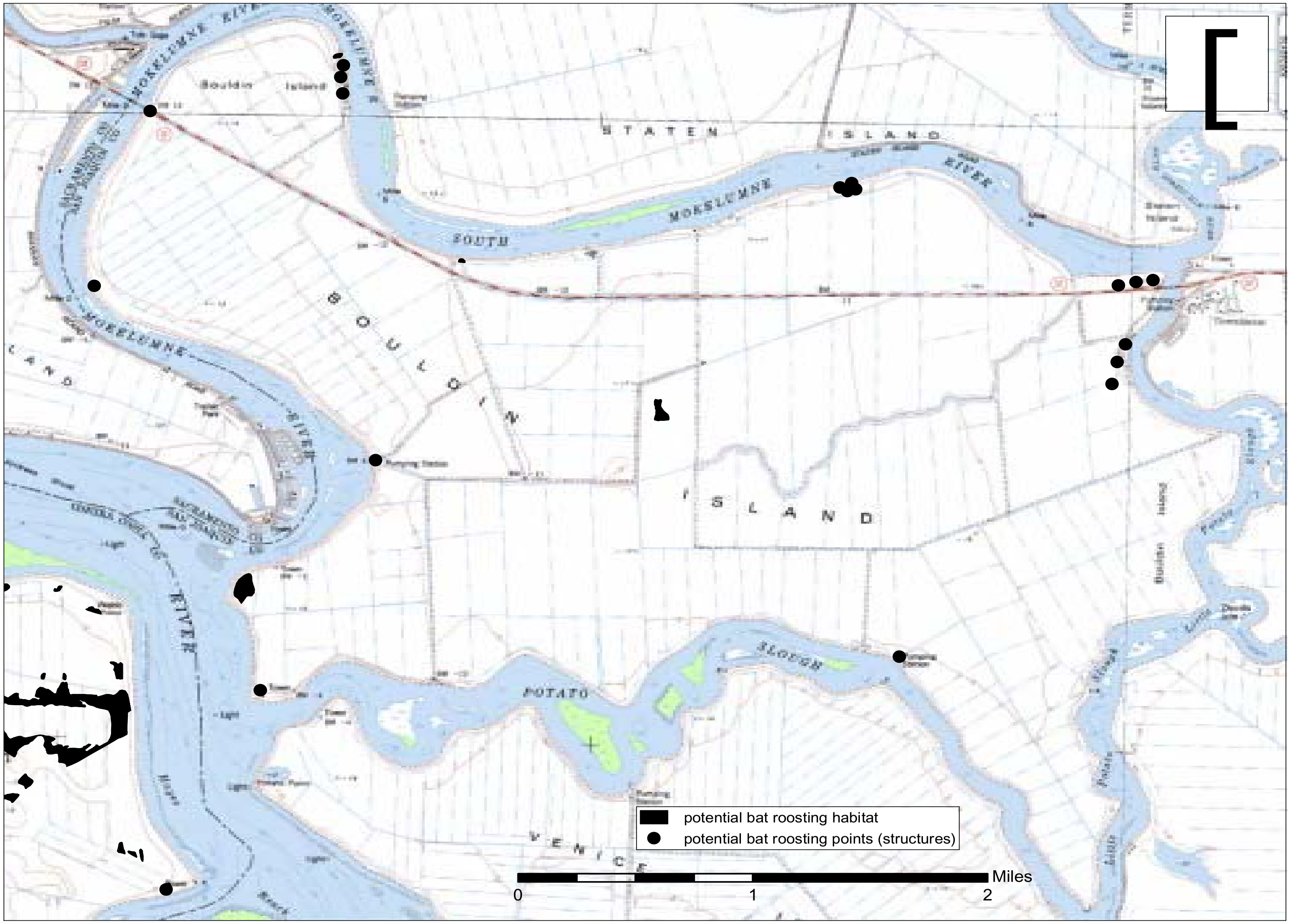
Discussion

Specific Bat Species

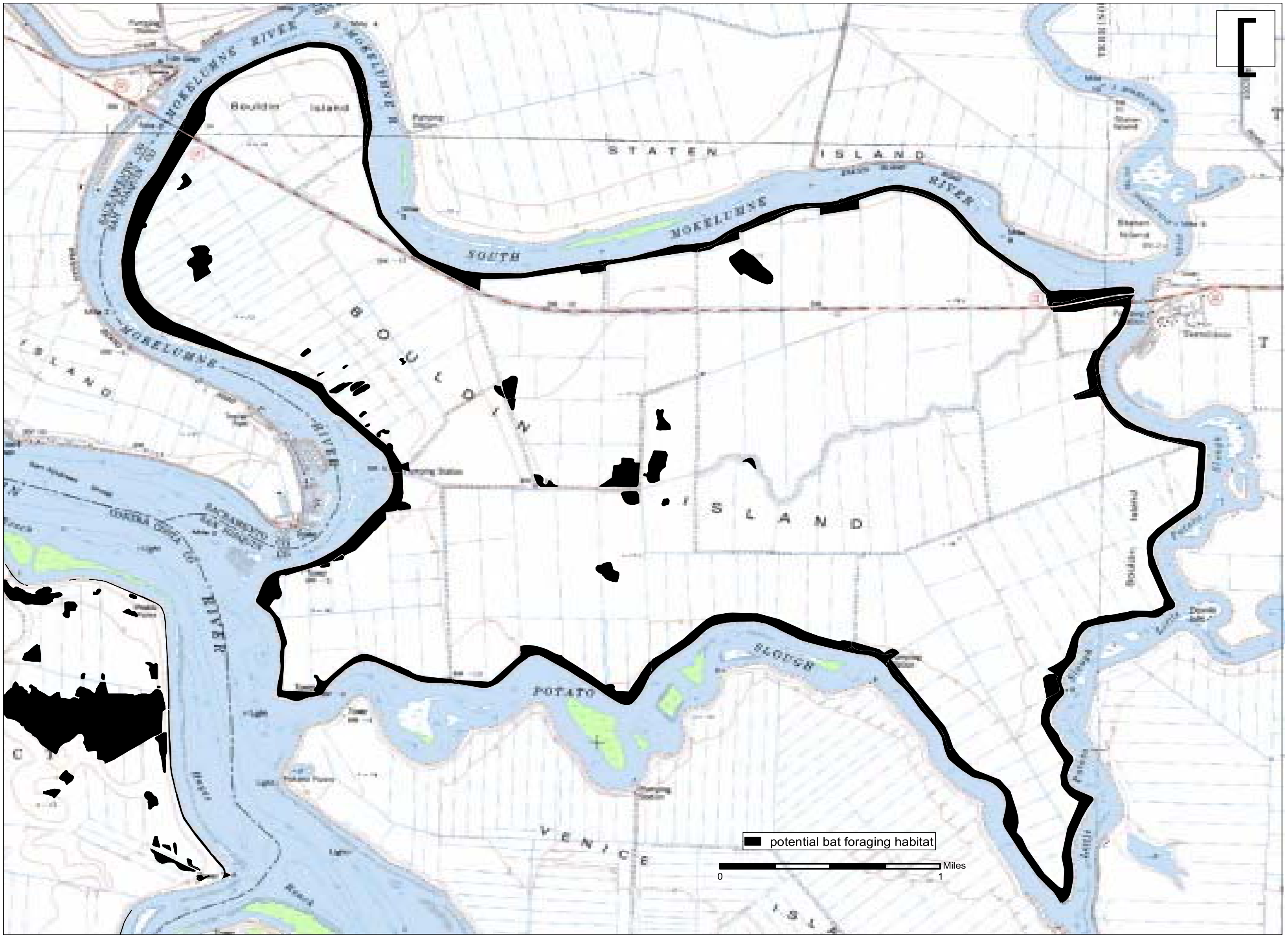
Based on the results of the habitat assessment and preliminary surveys of the Delta islands, these surveys were insufficient to fully address habitat suitability for the Townsend's big-eared bat, pallid bat, red bat, small-footed myotis, and Yuma myotis. The Townsend's big-eared bat and pallid bat are unlikely to be roosting on any of the islands but they may forage in the project area. Potential habitat for the red bat, Yuma myotis, and small-footed myotis is present and additional surveys would be necessary to address suitability. Potentially suitable habitat for other special-status bat species was not observed.

No suitable roosting habitat for the Townsend's big-eared bat was observed on any of the islands. Cave-like barns may be the only features on the islands that would be suitable, and of those surveyed none contained sign of occupancy. Potential insect prey for the Townsend's big-eared bat (e.g., butterflies and moths) was observed on all of the islands.

Potential roosting habitat for the pallid bat exists on all of the islands in hollow trees and structures. Potential insect prey for the pallid bat (e.g., beetles, grasshoppers, and crickets) was observed on each island. Pallid bats often roost in order to consume these larger prey items and the sign of this species' presence are roost sites where discarded pieces of the insects and recognizable guano are found. No pallid bat sign was observed. However, the development of mature riparian woodland and structurally



potential bat roosting habitat
potential bat roosting points (structures)
0
1
2
Miles
STATEN ISLAND
SOUTH MOKELUMNE RIVER
BOULDIN ISLAND
MOKELUMNE RIVER
POTATO SLOUGH
VENICE



potential bat foraging habitat
0
1
Miles
STATEN ISLAND
SOUTH MOKELUMNE RIVER
MOKELUMNE RIVER
BOULDIN ISLAND
POTATO SLOUGH
VENICE

complex vegetation interface habitats on Bouldin Island would provide forage habitat for pallid bats (Figure 5-31).

The riparian habitat on Webb Tract and Holland Tract may be potentially suitable for the western red bat. Red bats roost in foliage, usually riparian vegetation and cottonwoods and sycamores are most often mentioned as suitable tree species. The suitability of woodlands dominated by willows requires further investigation using acoustic monitoring to survey for red bat echolocation calls. Capture surveys would also be appropriate to verify presence if suitable netting sites are available. A combination of these techniques is the best survey method.

Potential foraging habitat for the Yuma myotis exists in the project area, especially over open water in lakes, ponds, and irrigation canals. This species often roosts in structures near water and no roost sites were observed on the islands.

Potential foraging habitat for the small-footed myotis exists in the project area, especially in riparian habitat and areas where treelines, shrubs, and grasslands form complex vegetation interfaces. This species often roosts in cliffs and rock formations and these specific roost types were not observed. The small-footed myotis will also roost in structures.

Roosting Habitat

Bats share similar cavity and crevice habitat preferences with swallows, owls, bees and wasps, which were common in the abandoned structures on the islands. The absence of roosting bats in abandoned structures was remarkable since they appeared to be suitable. Therefore, roosting habitat is not expected to be lost by building removal on Webb Tract and Bacon Island, however roosting habitat may be lost by flooding vegetation. The woodlands around the lakes on Webb Tract are the most likely area to be impacted by flooding.

A summary of impacts and survey recommendations are included in Table 5-14.

Webb Tract

Habitat was assessed on Webb Tract but surveys were limited because of access restrictions that precluded acoustic sampling of foraging activity after sunset. Acoustic surveys would be required to characterize foraging activity and, if bats are detected at or soon after sunset, then roosting in the woodland is likely. Flooding of Webb Tract will probably result in a significant loss of bat foraging habitat, and possibly roosting habitat. If DWR assumes that foraging and roosting occurs on Webb Tract, mitigation in kind for the habitat loss should be sufficient. Restoration and/or development of lakes and mature woodlands on Holland Tract and Bouldin Island could mitigate for the habitat loss.

Bacon Island

Flooding and building removal will result in a loss of bat foraging habitat on Bacon Island. Webb Tract and Bacon Island will become large open water reservoirs each with about 5,400 acres of surface water (when full) with no vegetation in an area known for strong wind. The water will be subject to wind and wave action that is not conducive to flying and echolocation by bats. Bat activity tends to be concentrated over calm freshwater (Zimmerman and Glanz, 2000). Project operations are not predictable, and, therefore, abrupt changes in water depth and surface area could occur (CALFED Bay-Delta Program, 2002) with an unknown effect on insect prey production.

Table 5-14. Summary Of Impacts And Survey Recommendations For The In-Delta Storage Program Bat Habitat Assessment

Delta Island	Suitable Habitat Present?	Flooding/Structure Removal Impacts	Habitat Island Impacts	Specific Surveys Recommended?
Webb Tract	Yes (not confirmed)	Assume flooding will result in foraging and roosting habitat loss Structure removal no impact	Not applicable	Yes: acoustic and possibly capture for each species
Bacon Island	Yes: foraging	Flooding will result in foraging habitat loss Structure removal (building lights) will result in foraging habitat loss, no roosting habitat loss	Not applicable	Probably not necessary
Holland Tract	Yes: foraging and possibly roosting	Not applicable	Expanding complex vegetation interfaces, creating water features will increase potential bat habitat	Yes: acoustic and possibly capture for each species
Bouldin Island	Unknown (possibly not)	Not applicable	Creating complex vegetation interfaces, expanding and creating water features will increase potential bat habitat	No

Some species of bats have been observed to avoid open air areas (such as would be available over the reservoirs) possibly due to problems with orientation, lack of protection from wind, lack of protection from predators, low insect abundance (Ciechanowski and Zajac, 2002), and lower foraging success (de Jong, 1994). Bats and the insects they prey on avoid wind and cooler temperatures such as would occur over open water. Bats are most likely to forage in sheltered areas rather than exposed areas (Vaughan *et al.*, 1997). Prey density is usually higher in habitats with vegetation (Kalcounis and Brigham, 1995).

The habitat loss could be mitigated by restoration / development of suitable features on the habitat islands. Mitigation in kind should be sufficient.

Holland Tract

Expansion of habitats in which foraging bats were detected, such as mature riparian woodland and structurally complex vegetation interface habitats (Figure 5-31), would potentially increase bat foraging habitat.

Figure 5-31. Vegetation interface with tree lines, shrubs, and grassland where foraging bats were detected on Holland Tract

Bouldin Island

Bouldin Island is limited in potential roosting and foraging habitat for bats. Developing habitat features such as ponds, lakes, irrigation canals, riparian woodlands, and areas where treelines, shrubs, and grassland interface may increase habitat use by bats. Expanding and deepening the ponds in the center of Bouldin to minimize emergent vegetation and retain open water may increase bat habitat. Larger, more open waterways with vegetation on the margins could be created similar to those on Holland Tract (Figure 5-32) to increase foraging habitat.

Figure 5-32. Irrigation canal lined with vegetation on Holland Tract as an example of habitat to develop on Bouldin Island

Summary

Habitat assessment and preliminary surveys are insufficient to fully address suitability of each island habitat for the five bat species identified by DWR. It is unlikely that the Townsend's big-eared bat and pallid bat are roosting on any of the islands but they may forage in the project area. Additional surveys would be necessary to address presence of the red bat, Yuma myotis, and small-footed myotis. No published bat studies conducted in or near the Delta are currently known.

Potential roosting habitat in structures is present on each of the islands but does not appear to be utilized. Therefore roosting habitat is not expected to be lost by building removal on the reservoir islands, however roosting habitat may be lost by flooding vegetation. Foraging habitat was confirmed on Bacon Island and Holland Tract near water features, riparian woodlands, and areas with complex vegetation structures. Webb Tract was not surveyed for foraging bats but it is recommended that the existence of bat habitat be assumed. No foraging bats were detected on Bouldin Island but the survey may have been insufficient due to inclement weather.

APPENDIX A. LIST OF WILDLIFE SPECIES OBSERVED DURING SURVEYS CONDUCTED FOR THE IN-DELTA STORAGE PROGRAM

Common Name	Scientific Name	Delta Island Observed	Comments
Western pond turtle	*Clemmys marmorata*	Holland Tract	Two locations SE corner California Species of Special Concern
Swainson's hawk	*Buteo swainsoni*	Webb Tract, Bacon Island, Holland Tract	Pair on Bacon Island California Threatened
White-tailed kite	*Elanus leucurus*	Bouldin Island	
Red-tailed hawk	*Buteo jamaicensis*	Holland Tract	Pair
Northern harrier	*Circus cyaneus*	Holland Tract	
Barn owl	*Tyto alba*	Webb Tract, Bacon Island, Holland Tract	
Great-horned owl	*Bubo virginianus*	Bouldin Island	Pair in grove NE corner
Cliff swallow	*Hirundo pyrrhonata*	Webb Tract, Bacon Island, Holland Tract	
Barn swallow	*Hirundo rustica*	Webb Tract, Bacon Island, Holland Tract	
Unid. herons		Holland Tact	Communal roost by lake
Mexican free-tailed bat	*Tadarida brasiliensis*	Bacon Island, Holland Tract	
Western pipistrelle	*Pipistrellus hesperus*	Holland Tract	
River otter	*Lutra canadensis*	Webb Tract, Bouldin Island	

Appendix D. Wetland and Giant Garter Snake Off-Site Mitigation Options for the In-Delta Storage Project Feasibility Investigation

Technical Memorandum

Wetland and Giant Garter Snake Off-Site Mitigation Options for the In-Delta Storage Project Feasibility Investigation

Prepared for

Department of Water Resources

April 2003

CH2MHILL
2485 Natomas Park Drive, Suite 600
Sacramento, CA 95833-2937

Wetland and Giant Garter Snake (*Thamnophis gigas*) Off-site Mitigation Options for the In-Delta Storage Project Feasibility Investigation

PREPARED FOR: Leslie Pierce, Senior Environmental Scientist, California Department of Water Resources

PREPARED BY: Dick Daniel, Project Manager, CH2M HILL

COPIES: Meri Miles, Project Scientist, CH2M HILL

DATE: April 28, 2003

Introduction and Background

This memorandum documents our assessment of off-site mitigation options for jurisdictional wetlands and the federally threatened giant garter snake (*Thamnophis gigas*), that could be adversely affected by the proposed In-Delta Storage Project (Project) if giant garter snakes are present on the impact islands. The Project would involve flooding Bacon Island and Webb Tract in the Sacramento-San Joaquin Delta for use as water storage facilities. The California Department of Water Resources (Department) is the state lead agency for this project. Costs associated with environmental mitigation will be used by the Department in assessing the feasibility of adding the Project as a new facility to the State Water Project (SWP) and / or the Central Valley Project (CVP).

Delta Wetlands Properties (Delta Wetlands) is a private-sector company that developed the Delta Wetlands Project, the project on which the In-Delta Storage Project is based. Delta Wetlands received a Clean Water Act, Section 404 dredge and fill permit for the Delta Wetlands Project on June 26, 2002, by the U.S. Army Corps of Engineers (Corps), Sacramento District. Terms of the permit included habitat compensation requirements for impacts to jurisdictional wetlands on Bacon Island, Webb Tract, Bouldin Island and Holland Tract. In 1997, an Incidental Take Statement was issued by the U.S. Fish and Wildlife Service (Service) for take of federally protected species associated with the Delta Wetlands Project. At that time, the giant garter snake was not considered present on the impact islands and was therefore not covered in the Incidental Take Statement. In April 2002, one giant garter snake was observed on Webb Tract. For the purposes of the State's feasibility study, the Department will assume that the giant garter snake is present on the Project islands.

Compensation Requirements for Jurisdictional Wetlands and Giant Garter Snake Habitat

Jurisdictional wetland compensation requirements for Bacon Island and Webb Tract in the Corps' Section 404 permit include: 1) 300 acres of cottonwood / willow woodland; 2) 132 acres of Great Valley willow scrub; 3) 85 acres of permanent pond; and 4) 345 acres of freshwater marsh. Boulder Island and Holland Tract were included in the Delta wetlands permit; however, under the current project, no impacts to jurisdictional wetlands on these islands are anticipated.

Giant garter snake compensation requirements are based on replacement of high and moderate quality giant garter snake habitat at a 3:1 replacement ratio (e.g., for every one acre impacted, three acres must be created) and a roughly 2:1 upland to aquatic ratio. These compensation requirements were established by Ryan Olah and Craig Aubrey of the U.S. Fish and Wildlife Service (Service) on February 5, 2003, during a meeting with the Department to discuss the Project. The extent and value of giant garter snake habitat that would be adversely affected by the Project were calculated based on the results of August and September 2002 habitat surveys conducted by Laura Patterson of the Department and Eric Hansen, a Consulting Herpetologist specializing in the giant garter snake. Based on the survey results, 3,345 acres of compensatory habitat would be required to mitigate the loss of giant garter snake habitat. Of that total, approximately 1,115 acres are necessary as aquatic habitat, and 2,230 acres are necessary as upland habitat.

On April 3, 2003, Leslie Pierce of the Department spoke with Mike Finan of the Corps' Regulatory Program in the Sacramento District. In this conversation, Mr. Finan said the Corps would allow the wetland mitigation to be counted toward meeting the aquatic habitat component of the giant garter snake mitigation as long as both the species needs and wetland requirements were met (pers. comm. Leslie Pierce, Department of Water Resources, April 3, 2003). Jurisdictional wetland habitats considered suitable for the aquatic component of giant garter snake mitigation include 85 acres of permanent pond and 345 acres of freshwater marsh, for a total of 430 acres. Jurisdictional wetland habitats considered suitable for meeting the upland component of giant garter snake mitigation include 300 acres of cottonwood / willow woodland and 132 acres of Great Valley willow scrub. For purposes of this cost analysis, only jurisdictional wetlands associated with the aquatic component of giant garter snake habitat are applied toward meeting the species' mitigation acreage requirement. This is because herbaceous upland, not riparian, comprises the "upland" component of existing giant garter snake banks and is reflected in the price per credit. Riparian habitat (e.g., cottonwood / willow) is considerably more costly to create than herbaceous upland, and would inflate the credit price for giant garter snake mitigation beyond the current market value at existing banks. Our mitigation cost projections for the Project are based on existing market values, and the use of riparian habitat to meet the upland component of the giant garter snake mitigation would distort the analysis.

Table 1 is a summary of the combined compensatory mitigation required for impacts to jurisdictional wetlands to giant garter snake habitat resulting from the Project.

TABLE 1
Jurisdictional Wetland and Giant Garter Snake Habitat Compensation Requirements

Habitat Type	Jurisdictional Wetland Compensation (acres)	Giant Garter Snake Compensation (acres)
Cottonwood/willow woodland	300	
Great Valley willow scrub	132	
Emergent marsh	0 (345 accounted for in the giant garter snake mitigation)	1,115
Permanent pond	0 (85 accounted for in the giant garter snake mitigation)	
Herbaceous upland		2,230

Off-site Mitigation Options for Wetland and Giant Garter Snake Mitigation

The Department's preferred approach for off-site mitigation is to purchase giant garter snake and wetland mitigation credits at an existing mitigation bank approved to service the Project area (pers. comm. Leslie Pierce, Department of Water Resources, March 2003). Wildlands, Inc. is the only company in the Sacramento Valley / Sacramento-San Joaquin Delta region that has publicly available mitigation credits for purchase. On April 2, 2003, Meri Miles from CH2M HILL and Leslie Pierce from the Department met with Kellie Berry, the Sales and Marketing Director for Wildlands, Inc. The purpose of this meeting was to discuss the Department's mitigation needs for the Project, identify existing mitigation banks with potential to service the Project, and discuss the approximate cost per mitigation credit. Ms. Berry cautioned that Wildlands, Inc. mitigation costs are subject to change and that cost information provided by Wildlands, Inc. may be appropriate for planning purposes, but should not be used for detailed costing related to project implementation. Use of the costs of Wildlands, Inc. mitigation credits in the Feasibility Report does not imply a commitment by the Department to purchase credits from Wildlands, Inc. if the Project proceeds.

Giant Garter Snake Mitigation Banks

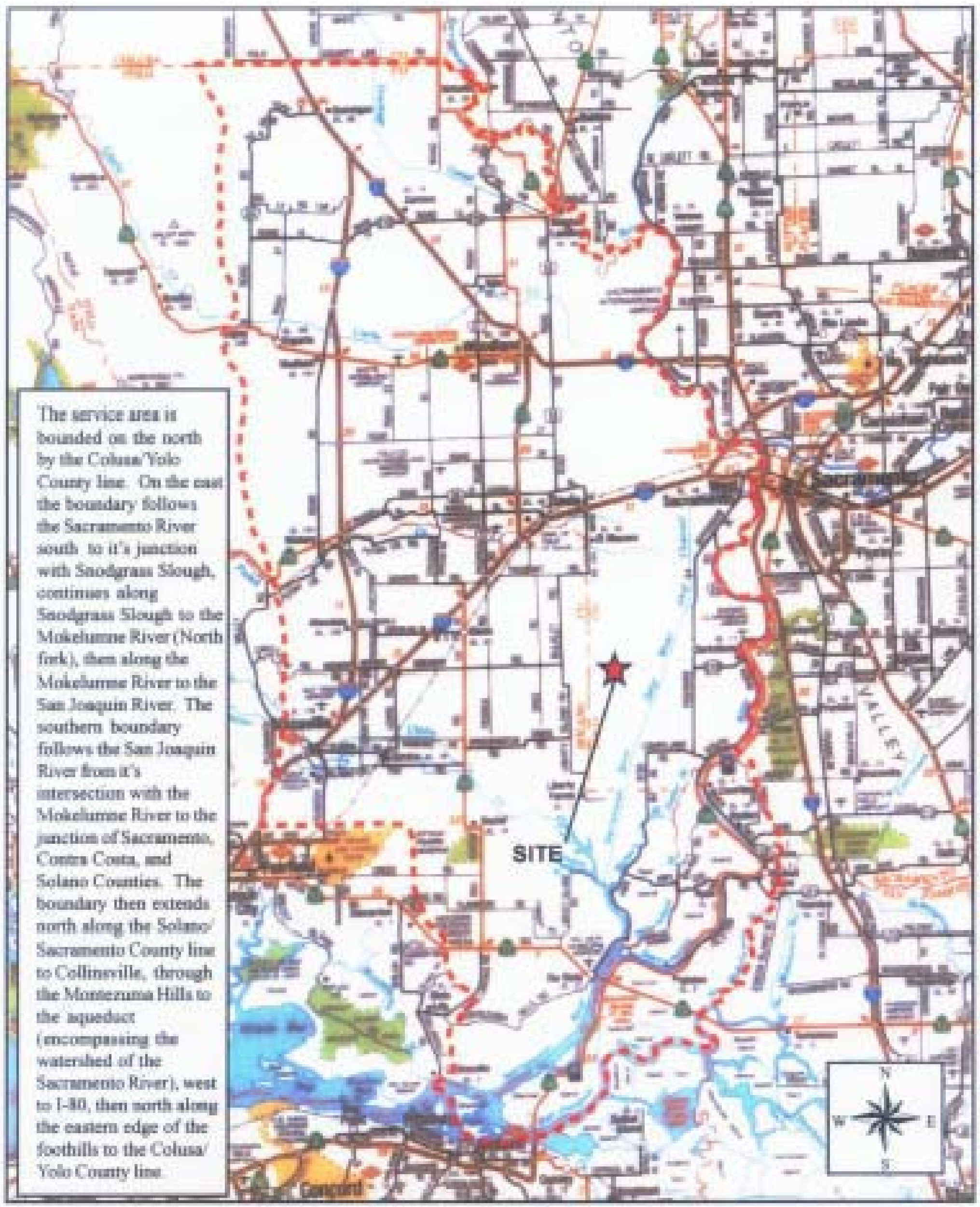
Pope Ranch is a 391-acre bank in Yolo County whose service area boundary extends south to Webb Tract in the Sacramento-San Joaquin Delta. Figure 1 illustrates the service area for the Pope Ranch Conservation Bank. In the February 5, 2003 meeting with the Service and Department of Fish and Game, Service staff indicated that Pope Ranch Conservation Bank could be used to mitigate giant garter snake impacts from the Project. Pope Ranch is the only bank approved to mitigate giant garter snake impacts in the Project area. Approximately 200 habitat credits are available at Pope Ranch. One credit is equivalent to one acre of high quality giant garter snake habitat, consisting of either emergent wetland, or channels with slow moving water and open water areas surrounded by at least 200 feet of upland. The Service's required 2:1 ratio of upland to aquatic habitat is built into each habitat credit. As a reflection of economy of scale, the cost per credit decreases with the number of credits purchased. Credit costs are subject to change, but the highest price per giant garter snake credit is currently $25,000 per acre. Significantly more credits are needed for the Project than Pope Ranch can provide. Ms. Berry explained that given the magnitude of compensatory habitat needed, a bank could be developed specifically for this Project. Alternatively, the Service manages a “Species Fund” for the giant garter snake in which permit applicants in need of giant garter snake mitigation can purchase mitigation credits at a cost of $37,500 per acre (Pers. Comm. Craig Aubrey, U.S. Fish and Wildlife Service, April 27, 2003). This option is typically made available for projects for which a mitigation bank is not available, and is not a mitigation method preferred by the Service (Pers. Comm. Craig Aubrey, U.S. Fish and Wildlife Service, April 27, 2003). It is presented here for the purposes of comparison to the open market cost of a giant garter snake mitigation bank credit, but the Species Fund would likely not be a viable mitigation option for the Project. Assuming a cost of $25,000 per acre, an estimated total cost for 3,345 acres of giant garter snake mitigation for the Project is $83,625,000.

Wetland Mitigation Banks

Compensatory habitat for freshwater emergent wetland and permanent pond was included in the giant garter snake mitigation; therefore, no additional mitigation for these wetland types is necessary. Compensation for the loss of cottonwood / willow woodland and Great Valley willow scrub on Bacon Island and Webb Tract is required to meet the conditions of the Section 404 permit issued for the Project. The Wildland Mitigation Bank in Placer County is the closest riparian mitigation bank to the Project area. This is a 616–acre bank owned and operated by Wildlands, Inc. The cost per riparian credit at this bank is currently $60,000 an acre. The Project area falls outside of the approved service area for the Wildland Bank, as shown in Figure 2. No banks are currently available to meet the 432-acre riparian compensation requirement in the Project’s Section 404 permit. Ms. Berry suggested that a new bank could be developed in order to service both riparian and giant garter snake mitigation for the Project. Assuming a worst-case scenario of $60,000 per acre, an estimated total cost for 432 acres of riparian woodland mitigation for the Project is $25,920,000.

Summary and Conclusions

No mitigation banks are currently available to service the entirety of Project impacts to the giant garter snake and jurisdictional wetlands. Based on current market values in the Sacramento Valley region, the cost per giant garter snake credit is $25,000 per acre, and the cost of riparian woodland is $60,000 per acre. The Sacramento District Corps will allow mitigation for emergent wetland and permanent pond to be counted toward meeting the aquatic habitat component of the giant garter snake mitigation as long as both the species needs and wetland requirements are met. Under a worst-case scenario, Project mitigation costs for jurisdictional wetlands and the giant garter snake are approximately $109 Million. Given the magnitude of compensatory habitat required to meet giant garter snake and jurisdictional wetland mitigation requirements, development of a mitigation bank specifically for the In-Delta Storage Project, or exploring mitigation options on suitable properties already owned by the Department or U.S. Bureau of Reclamation may be warranted.



Wildlands, Inc.

Pope Ranch Conservation Bank Service Area
Giant Garter Snake Mitigation Credits

FIGURE 1
CH2MHILL

FIGURE 2
Service Area For The Wildland Mitigation Bank in Placer County, California

CH2MHILL

Appendix E. Phase II Environmental Site Assessment Draft Report, May 2003